ABSTRACT

This capstone design final project research discusses the development of a control system using the Fuzzy-PID-based control droop method using Matlab software. An effective control system is needed to regulate and maintain the optimal performance of a smart microgrid system. The droop control method is used in many applications, including power distribution systems, distributed power generation, and motor speed control systems. However, the problem with the droop control method is its sensitivity to load changes and poor power switching.

In this study, the droop control method is combined with Fuzzy-PID logic to improve the performance of the control system. Fuzzy logic is used to improve sensitivity to load and fluctuations by producing accurate and adaptive responses to system conditions. PID (proportional-integral-derivative) is used to design a controller that can adjust the system response proportionally to changes in input and error.

This capstone design involves developing a mathematical model of a control system using the Fuzzy-PID-based control droop method and implementing it in a simulation system. Evaluation of the system performance is done by comparing the simulation results with the conventional droop control method and the Fuzzy-PID-based droop control method. The test results show that the Fuzzy-PID-based droop control method offers better performance in coping with voltage loads and fluctuations and has an adaptive response to changes in system conditions. This capstone design final project contributes to the development of a more efficient control system that will be implemented in smart microgrids. In addition, this research also opens the door for further development in the use of Fuzzy-PID-based control droop method in more complex and larger-scale control systems.

Keywords: Smart Microgrid, Control System, Control Droop Method, Fuzzy-PID